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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/809,295	03/16/2001	Junichiro Yoshioka	2001-0322A	5431

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EXAMINER

MUTSCHLER, BRIAN L

ART UNIT	PAPER NUMBER
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1753

DATE MAILED: 06/05/2003

10

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/809,295

Applicant(s)

YOSHIOKA ET AL.

Examiner

Brian L. Mutschler

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 May 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-81 is/are pending in the application.
- 4a) Of the above claim(s) 5-81 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-4 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 16 March 2001 is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 6.
- 4) ☐ Interview Summary (PTO-413) Paper No(s) _____.
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of Group I, claims 1-4, in Paper No. 9 is acknowledged.

Drawings

2. The drawings are objected to because it appears that reference sign **606** in Figure 3D should be changed to **609** to identify the housing and not the reflowing unit.
3. Figures 29A-29E and 30 should be designated by a legend such as --Prior Art-- because only that which is old is illustrated. See MPEP § 608.02(g).
4. The drawings are objected to as failing to comply with 37 CFR 1.84(p)(5) because they include the following reference sign(s) not mentioned in the description: Figure 25 includes reference sign **734**.
5. A proposed drawing correction, corrected drawings, or amendment to the specification to add the reference sign(s) in the description, are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

6. The disclosure is objected to because of the following informalities:
 - a. On page 23 at line 24, please change "menber54" to --member 54--.
 - b. On page 23 at line 27, please change "menber54" to --member 54--.

Appropriate correction is required.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

8. Claims 1 and 3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sakaki (U.S. Pat. No. 6,454,918) in view of Woodruff et al. (U.S. Pat. No. 6,309,524) and in view of Belongia et al. (U.S. Pat. No. 6,391,209).

Sakaki discloses a cup-type plating apparatus for plating wafers comprising a plating tank **1** for holding a plating liquid, an anode **8** immersed in the plating liquid, and a diaphragm **12** separating the anode **8** from the wafer substrate **3** (fig. 1; col. 7, lines 1-58). The apparatus further comprises separate plating liquid circulating systems comprising a main solution tank **21** that provides the plating liquid to the substrate and an auxiliary tank **22** providing plating liquid to the chamber containing the anode **8** (fig. 4; col. 7, line 59 to col. 8, line 34). The wafer **3** is placed over the opening at the top of the plating tank **1** and is attached to a wafer support **2** comprising a cathode (not shown) and a seal packing **5** for preventing leakage of the plating solution beyond the front surface of the wafer **3** (fig. 1; col. 7, lines 1-7).

Sakaki further teaches, "Existence of gases [evolved from the anode] is undesirable as they influence the current density" (col. 3, line 62 to col. 4, line 5).

Sakaki also discloses, "adjustment of the plating solution due to consumption of additives will become easier" by the use of separate circulation systems (col. 4, lines 6-18).

The apparatus of Sakaki differs from the instant invention because Sakaki does not disclose the following:

- a. The substrate holder is capable of opening and closing, as recited in claim 1.
- b. A deaerating unit provided in at least one of the plating liquid circulating systems, as recited in claim 1.
- c. The deaerating unit comprises a deaerating membrane and a vacuum pump, as recited in claim 3.

Regarding claim 1, Woodruff et al. disclose a cup-type plating apparatus for plating wafers comprising a plating tank, an anode immersed in plating liquid, and a substrate holder (fig. 1). In one embodiment, the substrate holder (reactor head) **30** comprises an outer body assembly **625** having an upturned lip **730** positioned on the front of the substrate **25**, which forms a seal to protect the contact **610** by forming a barrier to the electroplating environment (fig. 18; col. 13, lines 30-39). The substrate holder **30** is mounted on a lift/rotate apparatus **80** for rotating and positioning the substrate **25** for plating (col. 6, line 60 to col. 7, line 10). The positioning of the substrate **25** by the substrate holder **30** therefore opens and closes the top of the plating apparatus.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the substrate support of Sakaki to use a substrate holder as taught by Woodruff et al. because the substrate holder of Woodruff et al. automates the positioning of the substrate by using a lift/rotate apparatus, which would make the process more efficient.

Regarding claims 1 and 3, Belongia et al. disclose system and method for treating plating baths such as the plating baths used for the plating of semiconductor wafers and circuit boards (col. 1, lines 16-18). The system of Belongia et al. treats the plating liquid from the plating baths to remove contaminants and to adjust the plating solution for reuse and comprises sensors, such as gas concentration detectors, as well as a degasser to remove gases from the plating liquid (col. 7, line 65 to col. 8, line 10; col. 11, lines 16-23). The degasser can comprise a membrane and a vacuum on one side opposite the fluid.

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the apparatus of Sakaki to use a deaerating unit as taught by Belongia et al. because Sakaki teaches that the existence of evolved gases is undesirable and the degasser of Belongia et al. is an efficient means for removing such undesirable gases. It would also have been obvious to one having ordinary skill in the art at the time the invention was made to have used a vacuum pump for providing the vacuum in the degasser of Belongia et al. because a vacuum pump is an efficient means for providing a continuous and consistent vacuum.

Regarding the limitation "the pressure on the decompressed side of said deaerating unit being controlled", the limitation is a process of using the apparatus and therefore does not further limit the structure. The pressure in the apparatus described by the prior art above is capable of being controlled and teaches all of the structural limitations recited in the instant claims.

9. Claims 2 and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Sakaki (U.S. Pat. No. 6,454,918) in view of Woodruff et al. (U.S. Pat. No. 6,309,524) and in view of Belongia et al. (U.S. Pat. No. 6,391,209), as applied above to claims 1 and 3, and further in view of Uzoh et al. (U.S. Pat. No. 6,113,769).

Sakaki, Woodruff et al. and Belongia et al. describe an apparatus having the limitations recited in claims 1 and 3 of the instant invention, as explained above in section 8. Furthermore, Belongia et al. also teach the use of sensors **18** for monitoring the conditions in the plating liquid, wherein the sensor **18** can comprise gas concentration detectors (US '209 col. 7, line 65 to col. 8, line 10).

The apparatus described by Sakaki, Woodruff et al. and Belongia et al. differs from the instant invention because they do not disclose the use of a monitoring unit for monitoring the concentration of dissolved oxygen, as recited in claims 2 and 4.

Uzoh et al. discloses an apparatus for monitoring and controlling the plating baths to control the plating uniformity in process using electronic packages or silicon wafers for substrates (col. 3, lines 31-55). The apparatus comprises at least one sensor or monitor **31** for sensing and monitoring conditions in the plating liquid, wherein the

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sensor 31 can be an oxygen sensor "to monitor dissolved and/or non-dissolved oxygen content" (col. 4, lines 27-51).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to have modified the apparatus described by Sakaki, Woodruff et al. and Belongia et al. to use a monitoring unit for detecting the amount of dissolved or non-dissolved oxygen in the plating solution as taught by Uzoh et al. because monitoring and controlling the plating solution can improve the plating uniformity by maintaining consistent plating solution concentrations.

Conclusion

10. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. U.S. Pat. No. 3,623,962 issued to Beale also discloses the use of a deaerating unit in a plating apparatus to remove oxygen dissolved in the plating solution.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Brian L. Mutschler whose telephone number is (703) 305-0180. The examiner can normally be reached on Monday-Friday from 8:00am to 4:30pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam Nguyen can be reached on (703) 308-3322. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications.

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Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

A handwritten signature in black ink, appearing to read 'Nam Nguyen', is written over the printed name.

NAM NGUYEN
SUPERVISORY PATENT EXAMINER
TECHNOLOGY CENTER 1700

blm
May 29, 2003